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CNC CHARLESTON
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TECHNICAL MEMORANDUM UPDATE ON AREA OF CONCERN 613 (AOC 613)
GROUNDWATER ASSESSMENT CNC CHARLESTON SC
8/30/2002
CH2M HILL

AOC 613 Zone F
Update on GW Assessment

Update on AOC 613 Groundwater Assessment; August 2002

PREPARED FOR: CNC BCT

PREPARED BY: Louise Palmer/CH2M-Jones

DATE: August 30, 2002

This Technical Memorandum (TM) describes the results of recent sampling conducted at AOC 613, the Former Locomotive Repair Shop, Building 1169, in the Charleston Naval Complex (CNC) in Charleston, South Carolina. Initial sampling was conducted as described in the *Phase I Interim Measure Work Plan; Source Delineation Sampling and Analysis Plan for AOC 613, Zone F* (CH2M-Jones, June 2002). This TM evaluates data from the central area of AOC 613, located between Buildings 242 and 255. Results from additional sampling from other areas of the site will be presented at a later date.

Background

The chlorinated solvents PCE and TCE, along with their degradation products 1,2-DCE and vinyl chloride, had been identified in groundwater along the southwest side of Building 255, the Warren Lasch Conservation Center. Building 255 was constructed in the 1980s, after activities at AOC 613 had ceased and Building 1169 was demolished. The Hunley Submarine, a Civil War artifact, is currently housed in the northeast corner of Building 255. Other archeological artifacts and sensitive laboratory operations are carried out in the eastern half of the building.

Generally, only trace concentrations (10's of µg/L) of chlorinated volatile organic compounds (CVOCs) had been detected at AOC 613 during the RFI. The *RFI Report Addendum & CMS Work Plan, AOC 613/615/SWMU 175, Zone F* (CH2M-Jones, 2002) details the CVOCs identified in groundwater up to the year 2000. However, one groundwater sample collected in 1996 at location F613GP039, near the southwest corner of Building 255, had CVOC concentrations several orders of magnitude higher than all other site samples, suggesting a potential source area in its vicinity. The groundwater sample had been collected using direct push technology (DPT) approximately 5 feet from Building 255 at an unknown depth. CVOC concentrations from F613GP039 were estimated at :

- PCE - 1,900 µg/L
- TCE - 1,500 µg/L
- total - 1,2-DCE 1,700 µg/L
- Vinyl chloride - 38 µg/L

Phase I Interim Measure Work Plan

The AOC 613 Phase I Interim Measure (IM) was intended to confirm the existence of a source area of CVOCs in the vicinity of F613GP039. If a source area was identified, an IM would be considered. A row of five groundwater sample locations was planned along the outside wall of Building 255. Groundwater was to be sampled using a Waterloo Profiler to obtain three discrete depth samples at each location. Groundwater sampling was also planned at five locations inside Building 255, if the results of samples collected outside the building suggested that a potential source area was present beneath the building.

To identify the optimum sampling depth, a continuous sample soil core was first collected in the vicinity of the former 613GP039. Soil was sampled to a depth of 28 ft in 4-ft segments and visually inspected for saturated and permeable zones. A log of the soil core is presented in Appendix A of this TM. This log was very similar to geotechnical boring logs prepared for the design of Building 255 foundations. The core identified very thin slightly permeable zones at 11.4 to 11.5 ft and a moderately water-bearing silty sand at 20 to 23 feet below grade. No odors or visible signs of solvents were identified in the samples.

Because the water-bearing zones were not very permeable, it appeared that the Waterloo Profiler would not have enough screen length to collect enough water for a VOC sample. Therefore, the sampling method was changed to DPT geoprobe samples with 4-ft screen lengths. Groundwater was to be collected at 8 – 12 ft, 14 – 17 ft, and 20 – 24 ft below grade at each of the sample locations.

Groundwater samples from DPT locations 613GP069 through 613GP073 were planned outside the building, and 613GP074 through 613GP078 inside the building. The outer samples would be collected first to corroborate the 1996 data. The locations of the groundwater samples inside the building would be adjusted on the basis of the CVOC concentrations outside the building.

In addition, groundwater monitoring wells in the area would be sampled for CVOCs. Two wells out of a set of six monitoring wells installed to investigate UST Site 22 west of 613GP039 were to be sampled, along with three other RFI monitoring wells. The UST wells are labeled U22GW002 through U22GW007. All except U22GW007 were screened approximately 3 – 13 ft below grade; the latter was screened 25 – 30 ft below grade. Shallow RFI monitoring wells 613GW004, 613GW009, GELGW012 were also planned to be sampled. Figure 1 shows groundwater monitoring wells in the CVOC plume area.

2001 Groundwater Data

Before the results of the 2002 sampling effort are discussed, groundwater CVOC data from 2001 will be presented. All of the monitoring wells at UST Site 22 were sampled in May 2001, and the RFI wells in the area were sampled in June 2001. Figures 2, 3, and 4 show TCE, 1,2-DCE, and vinyl chloride data from these sampling efforts (in 2001, PCE was detected only at 613GW004, at an estimated concentration of 0.35 µg/L). TCE concentrations were all measured below the MCL of 5 µg/L; 1,2-DCE concentrations (primarily composed of cis-1,2-DCE) were measured as high as 85 µg/L at 613GW004, and vinyl chloride was measured as high as 14 µg/L at U22GW003.

2002 Groundwater Data

In July 2002, the three RFI and two UST monitoring wells were sampled for CVOCs. In addition, groundwater from DPT samples at 613GP069 through 613GP073 was collected. Attempts were made to collect groundwater at all three sample interval depths, but except for 613GP069, water was only available from the 20 – 24 ft depth interval. At 613GP069, the depth interval 8 – 12 ft also yielded sufficient water for a sample. The lack of groundwater was consistent with the core log at location 613GP070, which showed predominantly clay soil in the subsurface.

Figures 5, 6, and 7 present TCE, 1,2-DCE, and vinyl chloride data from the July 2002 sampling efforts (in 2002, PCE was detected only at 613GW004, at an estimated concentration of 0.42 µg/L.) TCE was again measured below the MCL; 1,2-DCE concentrations were measured as high as 75 µg/L at 613GW004, and vinyl chloride was measured as high as 10.2 µg/L at 613GW004. It should be noted that the well with the highest vinyl chloride content in 2001 was not sampled in the July 2002 sampling event.

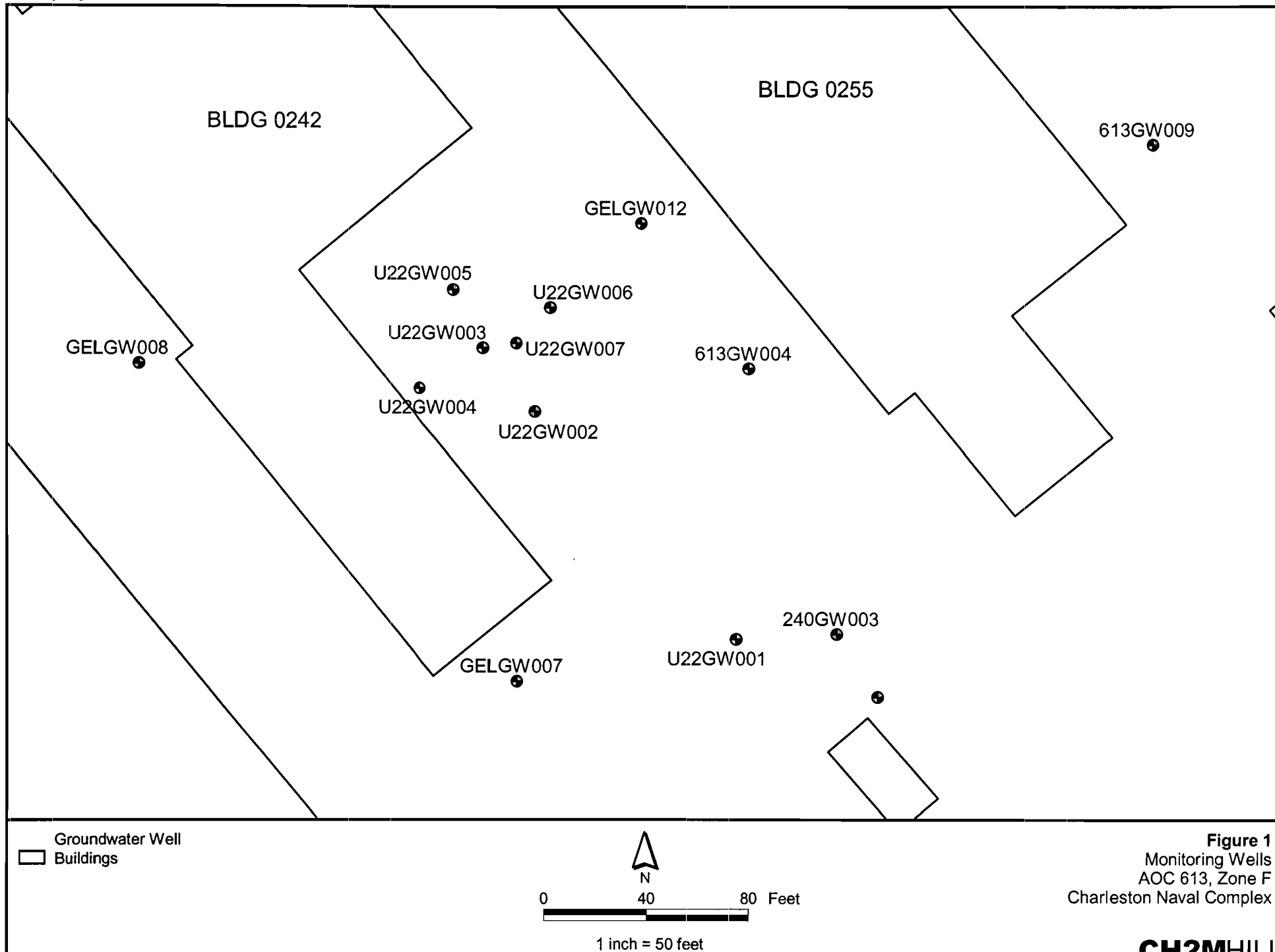
Groundwater data from the DPT samples located along Building 255 indicate only trace concentrations of TCE and 1,2-DCE; no PCE or vinyl chloride were detected. Sampling location 613GP070 was collected at the former location of 613GP039 (where the previous elevated CVOc detections were reported), and only 1,2-DCE (0.9 µg/L) was identified at that location.

Evaluation and Conclusions

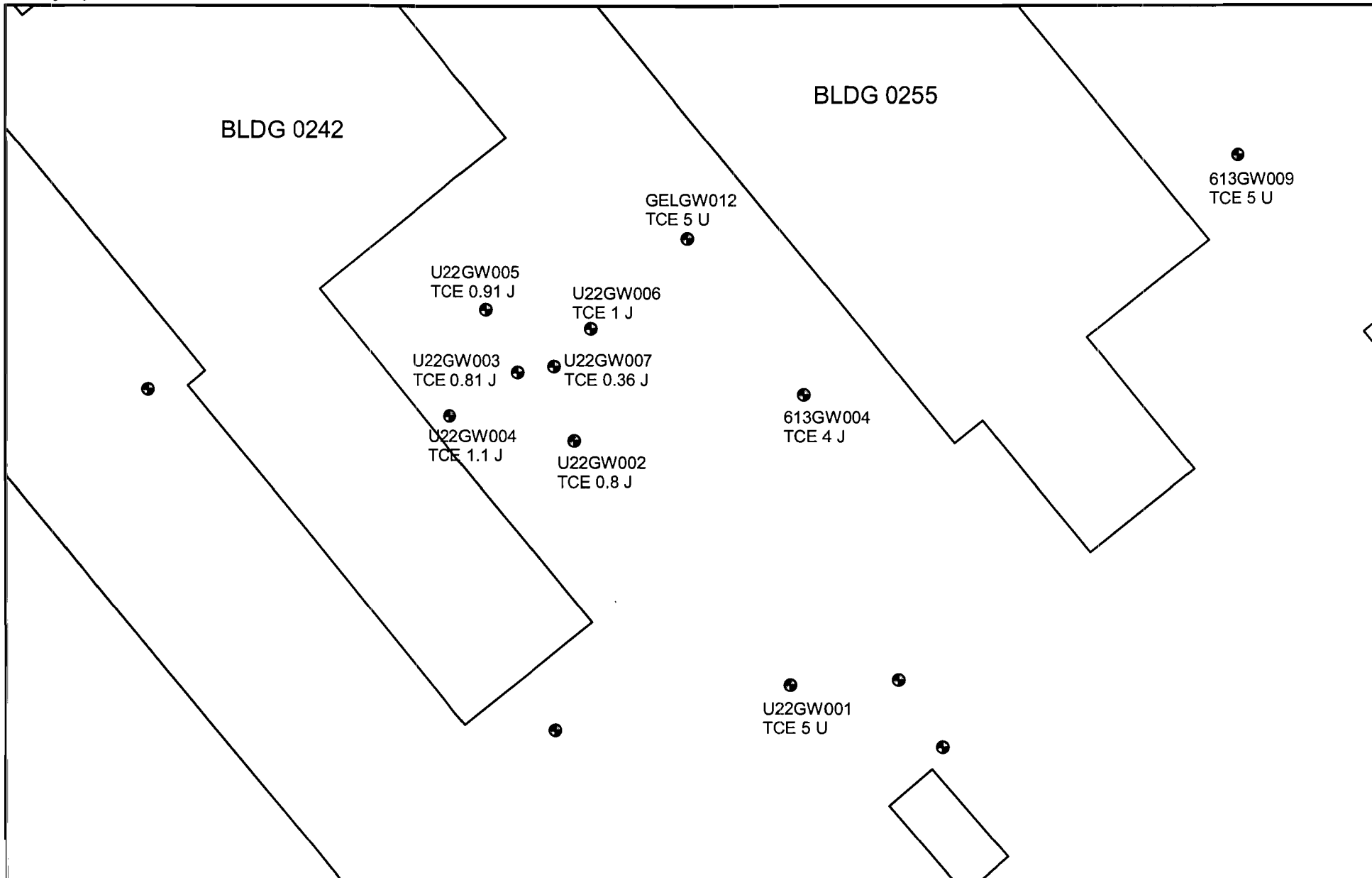
DPT sampling along the edge of Building 255 did not confirm the presence of a source area for CVOcs adjacent to or beneath Building 255. Although the source of the relatively elevated CVOc concentrations from 613GP039 is not known, it is apparent that it does not exist in 2002. The lack of CVOcs along the building wall also indicates the anticipated lack of CVOcs in groundwater beneath the building. It therefore appears unnecessary to conduct sampling within the building or at additional locations in this immediate area. Because the objectives of the Phase I Interim Measure Work Plan have been achieved, CH2M-Jones plans to conduct no additional DPT sampling in this area.

The 2001 data indicate that the plume of daughter products (1,2-DCE and vinyl chloride) may extend into the UST Site 22 area. CH2M-Jones proposes resampling all of the UST Site 22 wells, including the one in the downgradient direction (U22GW001), along with monitoring wells 613GW004, 613GW009, GELGW008, and GELGW012. A CMS would then be performed to evaluate remedial options at the site.

NOTE: Original figure created in color



NOTE: Original figure created in color



Groundwater Well
Buildings

Note: MCL = 5 ug/L

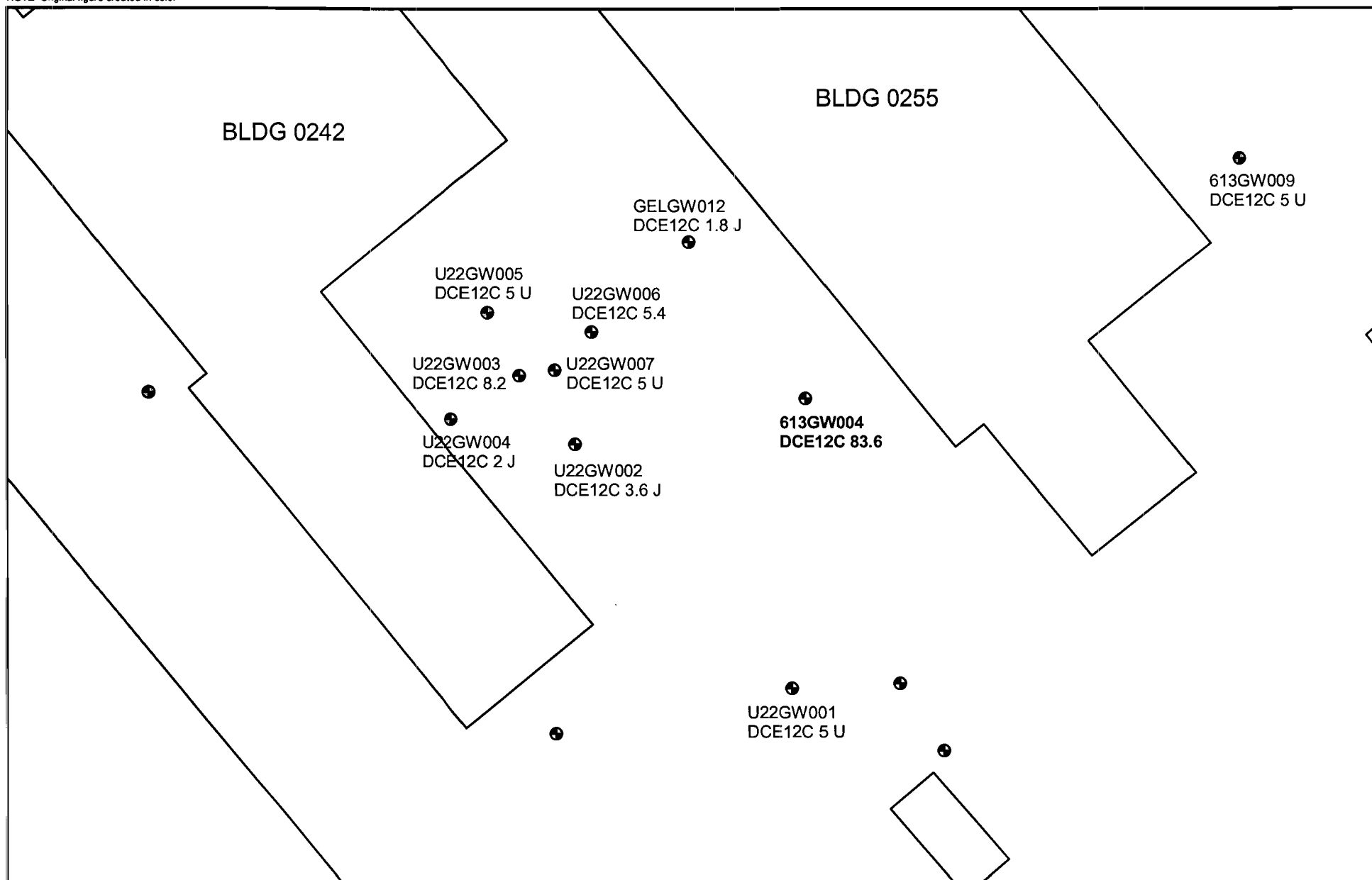


1 inch = 50 feet

Figure 2
2001 Data - TCE
AOC 613, Zone F
Charleston Naval Complex

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NOTE: Original figure created in color



Groundwater Well
 Buildings

Note: Concentrations in bold exceed MCL = 70 ug/L

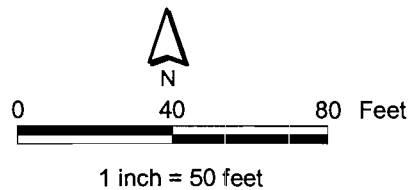
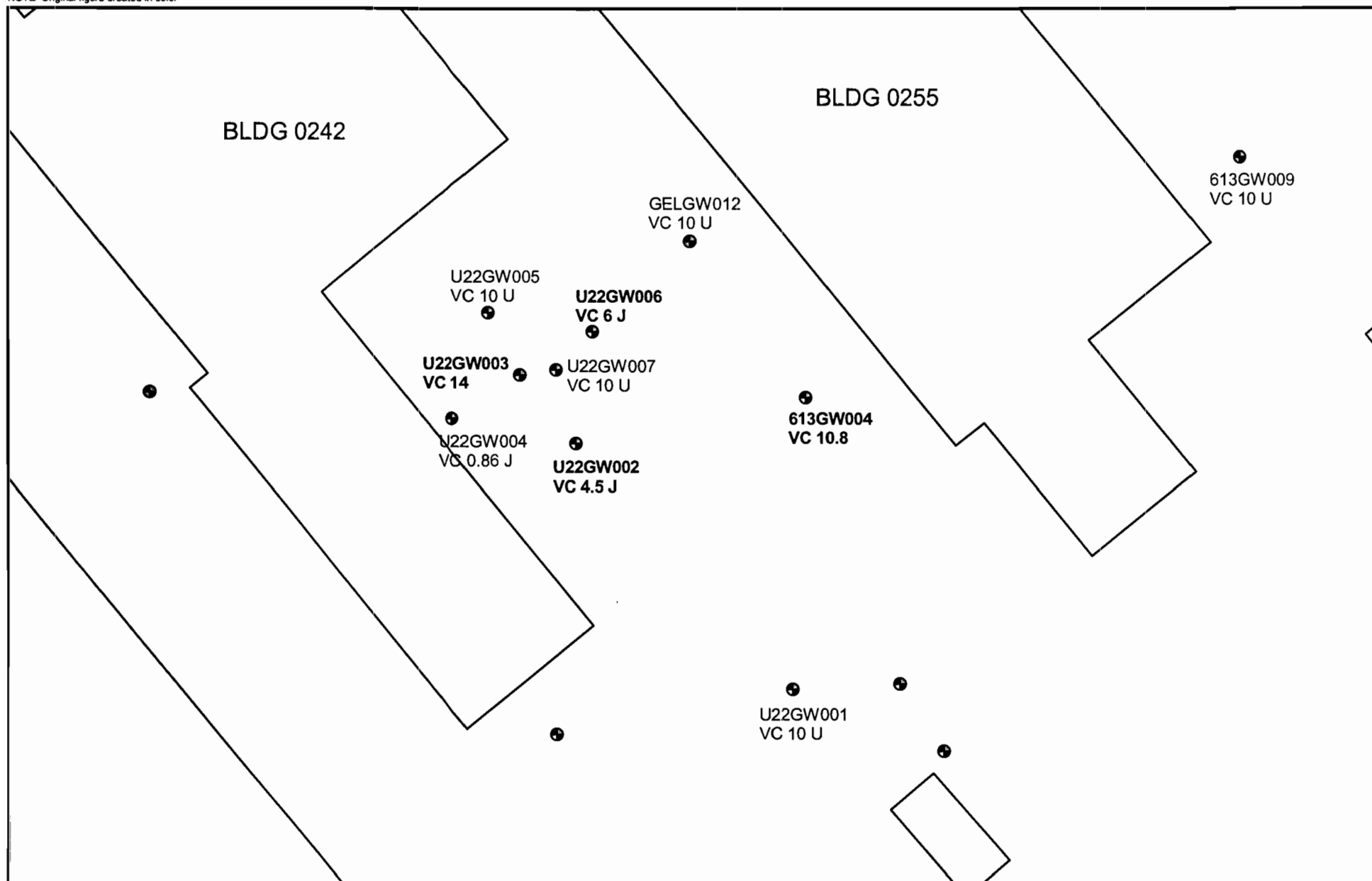


Figure 3
 2001 Data - cis-1,2,DCE
 AOC 613, Zone F
 Charleston Naval Complex

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NOTE: Original figure created in color



Groundwater Well
 Buildings

Note: Concentrations in bold exceed MCL = 2 ug/L

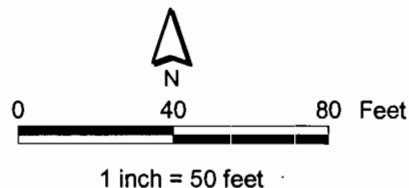
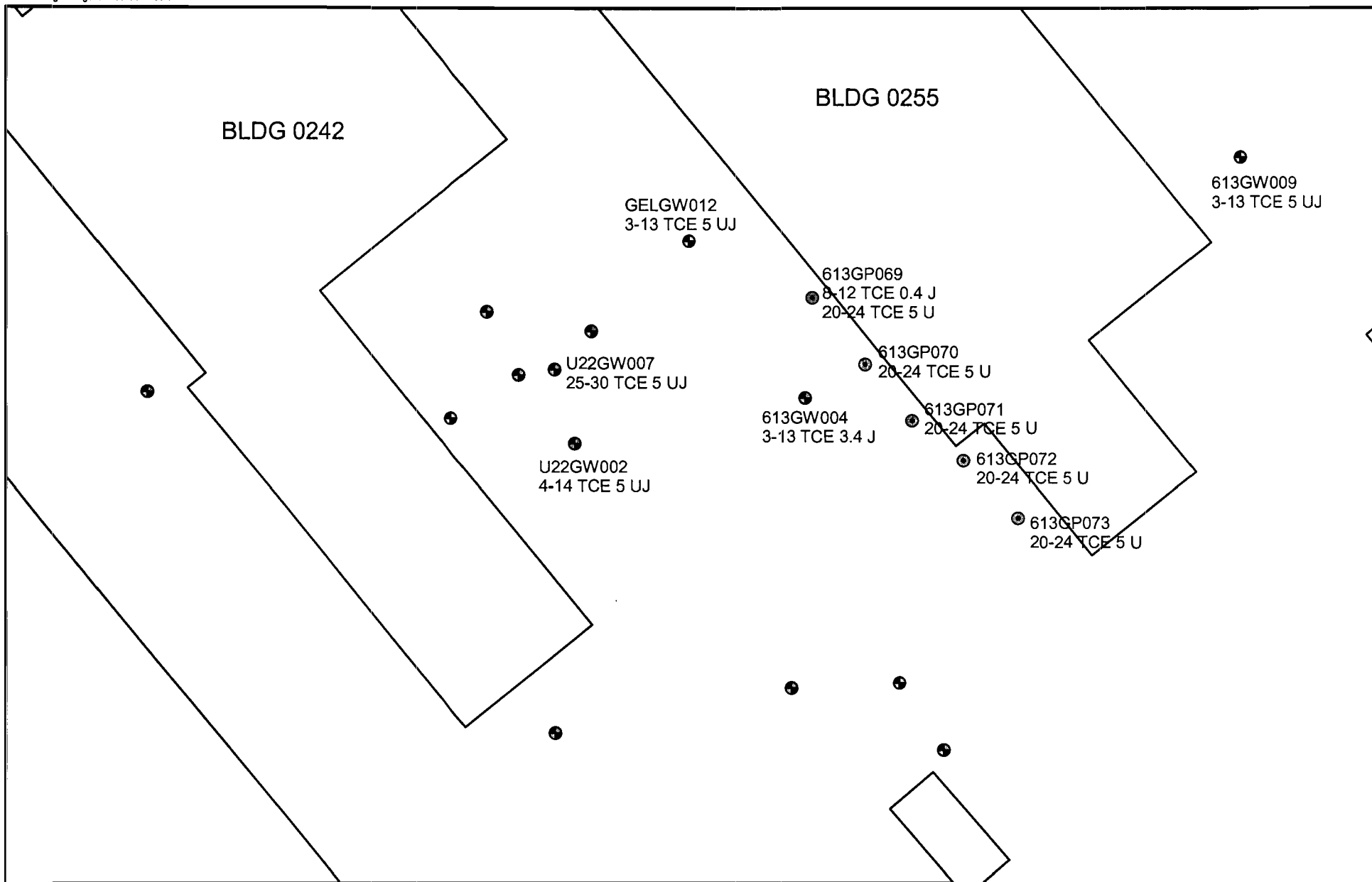


Figure 4
 2001 Data - Vinyl Chloride
 AOC 613, Zone F
 Charleston Naval Complex

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NOTE: Original figure created in color



Groundwater Probe
Groundwater Well
Buildings

Note:
1) MCL = 5 ug/L
2) Screen depth in ft below ground surface

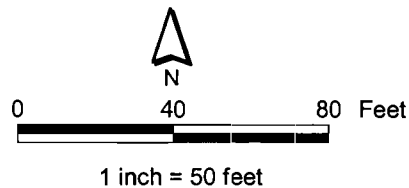
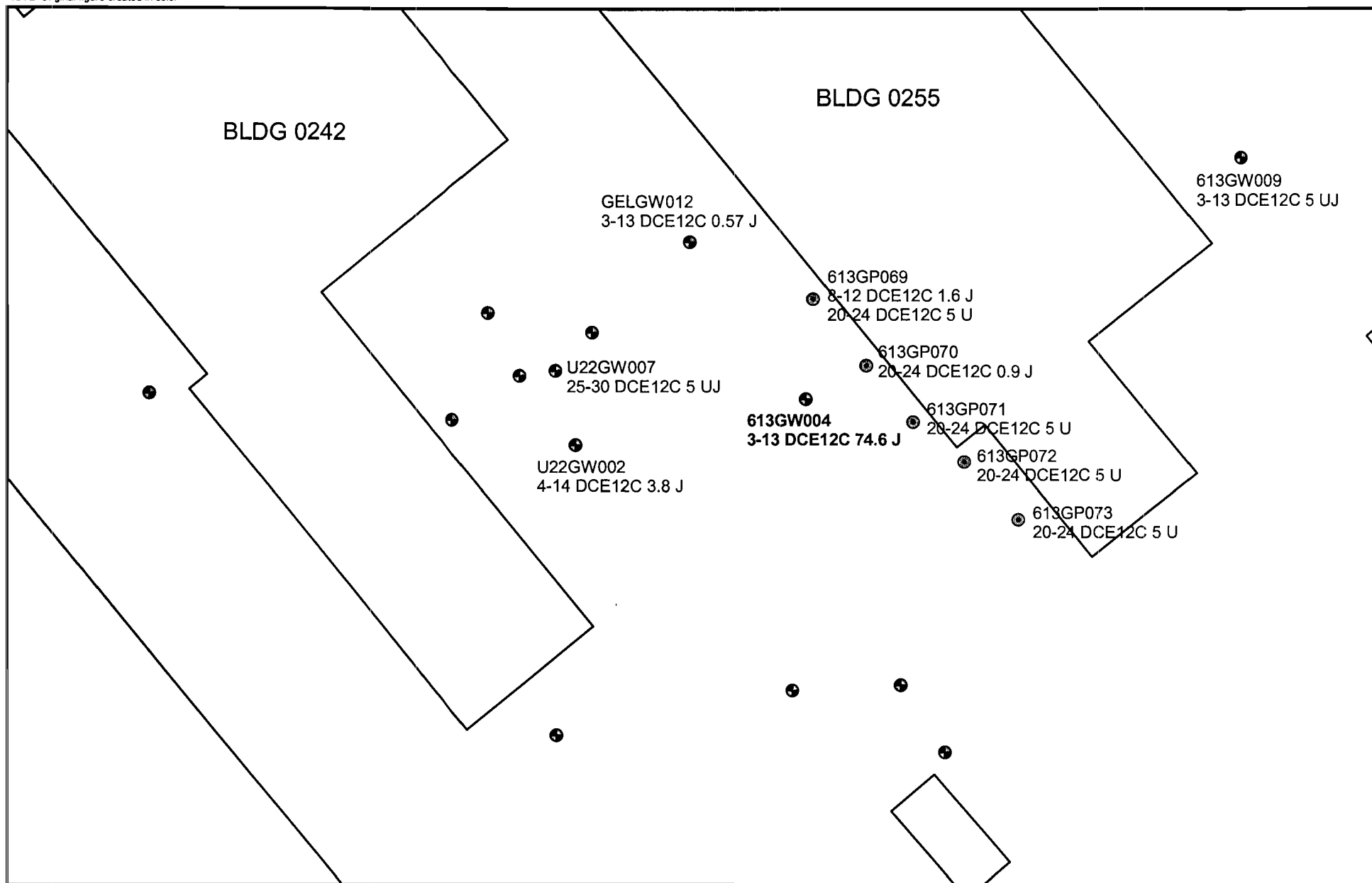


Figure 5
2002 Data - TCE
AOC 613, Zone F
Charleston Naval Complex

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NOTE: Original figure created in color



Groundwater Probe
Groundwater Well
Buildings

Note:

- 1) Concentrations in bold exceed MCL = 70 ug/L
- 2) Screen depth in ft below ground surface

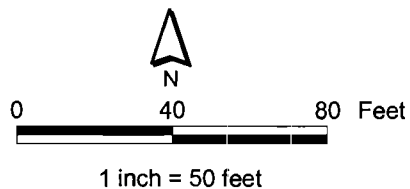
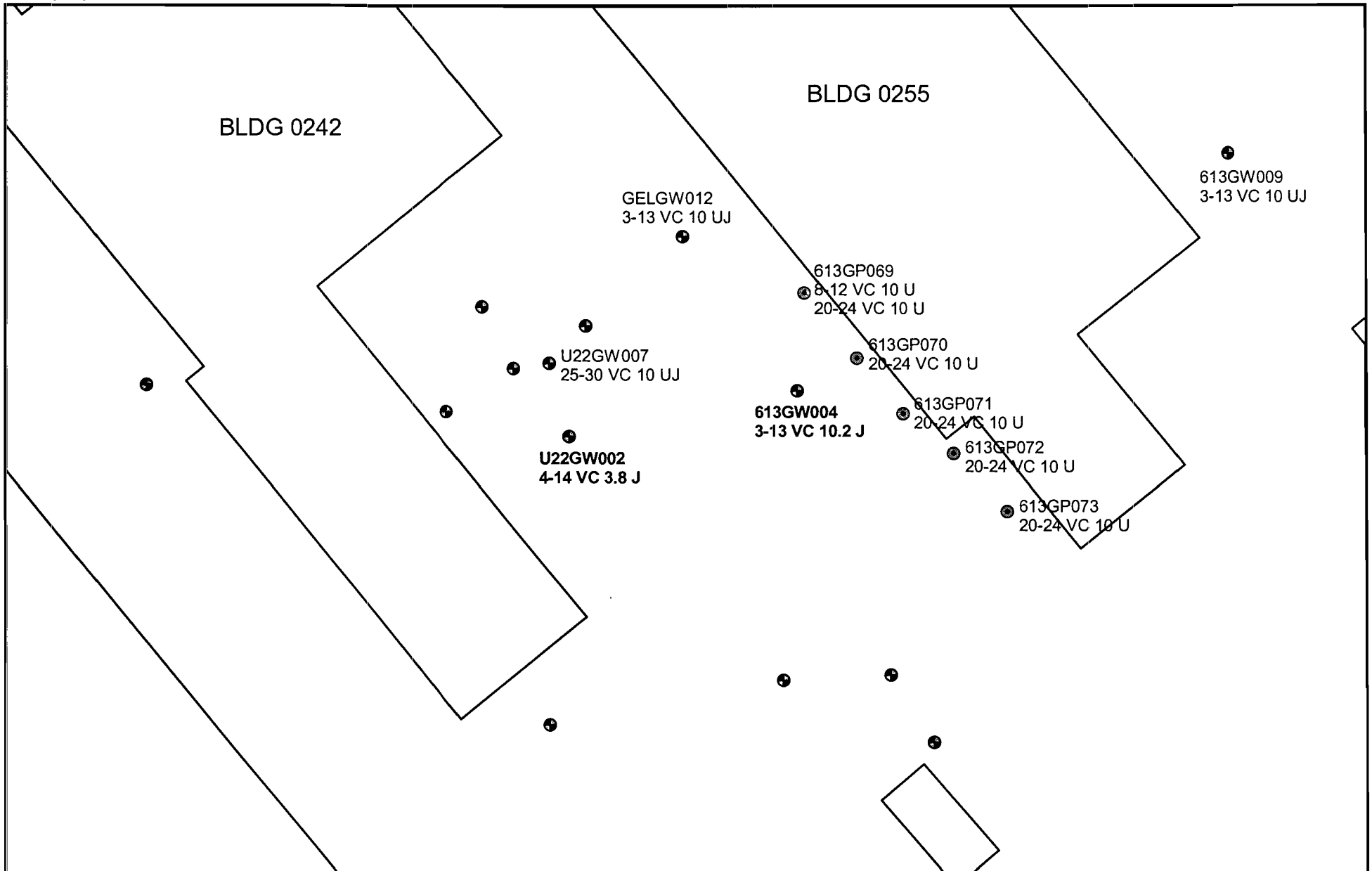


Figure 6
2002 Data - cis-1,2,DCE
AOC 613, Zone F
Charleston Naval Complex

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NOTE: Original figure created in color



Groundwater Probe
Groundwater Well
Buildings

Note:

- 1) Concentrations in bold exceed MCL = 2 ug/L
- 2) Screen depth in ft below ground surface

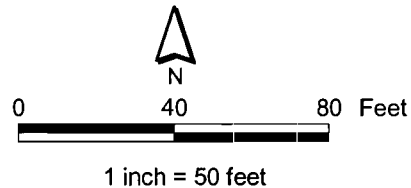


Figure 7
2002 Data - Vinyl Chloride
AOC 613, Zone F
Charleston Naval Complex

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**CH2MHILL****Boring Number: F613GP070**

Sheet: 1 of 2

Client: US Navy**Project:** Charleston Naval Complex**Location:** Building 255**Project Number:** 158814.ZF.PR.02**Driller:** Prosonic**Drilling Method:** Geoprobe - DPT**Sampling Method:** Continuous Sample (4ft core)**Logged by:** William Elliott**Start/Finish Date:** 6/19/2002 - 6/19/2002

Depth (ft)	Sample Information				Soil Log	Soil Description	Depth / Elev (ft)	Comments
	Sampl	Sample Type	Recovery (Ft)	SPT (6"-6"-6")				
0						Ground Surface	0.0	0905 - Richard from Prosonic was on site
						Asphalt/fill	0.0	
						Fill	1.0	0910 - Open hole with rock bit through asphalt, hand auger to 4' - hit rock/concrete at approximately 2'
	001	DPT				Sand/gravel, orange	2.0	
						Clay, fat CH - Gray, very stiff, plastic, dry to slightly moist	3.0	
						Clay CL - Brown/tan, silty, plastic, moist, organic mottling		
5						as above, grading to green with iron stains at 5.5', very moist	5.5	0915 - Move (offset) 1' + 1' and open hole again - rock @ 1' auger to 4'
	002	DPT				Clay, fat CH - Green, very stiff, very plastic, slightly moist, abundant iron staining - becoming siltier at 8'		
								0930 - Push 4' macrocore sampler to 8'
								0935 - Push 4' macrocore sampler to 12'
10	003	DPT				Clay CL - Green, silty, moist, plastic	10.5	0945 - Push 4' macrocore sampler to 20'
						Sand SM - Brown, silty	11.5	
						Clay CL - Green, silty, moist, plastic, orange iron staining, grading siltier with depth		
	004	DPT				13.2' to 14.0' tan to green, some silt, no iron stains	14.0	
15						Clay, fat CH - Light green, very stiff and plastic, moist, no iron stains		0955 - Push 4' macrocore sampler to 24'
						15.0' to 15.1' - Orange		
	005	DPT				15.1' to 16.0' - Tan sticky clay, plastic, w/ fine grained black inclusions		
						16.0' - Yellow mottling		
20							20.0	

Client: US Navy

Project: Charleston Naval Complex

Location: Building 255

Project Number: 158814.ZF.PR.02



Driller: Prosonic

Drilling Method: Geoprobe - DPT

Sampling Method: Continuous Sample (4ft core)

Logged by: William Elliott

Start/Finish Date: 6/19/2002 - 6/19/2002

Depth (ft)	Sample Information				Soil Log	Soil Description	Depth / Elev (ft)	Comments
	Sample	Sample Type	Recovery (Ft)	SPT (6"-6"-6")				
25	006	DPT				Clay/Sand CL/SM - Green/gray, clay/sand mix - very fine grained sand w/ black inclusions, becoming less clayey - more silty at 22.0', color grades to olive tan at 22.0'	22.5	1005 - Push 4' macrocore sampler to 28'
						23.0		
	007	DPT				Silt ML - Olive green, w/ black inclusions, fine grained sand laminae, stiff, plastic, blocky structure	24.0	
						Silt/Sand ML/SM - Olive, very fine grained sand, abundant black trace minerals, white/buff mollusk fragments, moist, stiff	28.0	
						Silt/Clay ML/CL - Olive green, stiff, moist, very plastic at 28.0', black trace minerals, very fine sand, no mollusks, becoming more clayey	28.0	
30						End of Log		1015 - Check w/ Darryl Gates. Review old boring logs from Bldg. Supt. (John), confirm Cooper Marl encountered as silt @ 28'
								1030 - Grout borehole
35								
40								